

REPORT DOCUMENTATION PAGE AD-A254 880

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1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE June 5, 1992		3. REPORT TYPE AND DATES COVERED Technical — 5/31/91 — 6/30/92	
4. TITLE AND SUBTITLE "SYNTHESIS AND CONDUCTIVITY OF COPOLYMER OF 4-4'-DIAMINODIPHENYLAMINE AND TEREPHTHALOYL CHLORIDE"				5. FUNDING NUMBERS G—N00014-90-J-1559	
6. AUTHOR(S) G. Gordon, J. Yue and A.J. Epstein					
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) University of Pennsylvania Department of Chemistry Philadelphia, PA 19104-6323				8. PERFORMING ORGANIZATION REPORT NUMBER 1992-12	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Sponsoring Agency: DARPA 3701 N. Fairfax Drive Arlington, VA 22203-1714 Monitoring Agency: ONR 800 N. Quincy Street Arlington, VA 22217-5000				10. SPONSORING / MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES					
12a. DISTRIBUTION / AVAILABILITY STATEMENT Distribution Unlimited				12b. DISTRIBUTION CODE	
<div style="border: 1px solid black; padding: 5px; text-align: center;"> DISTRIBUTION STATEMENT A Approved for public release Distribution Unlimited </div>					
13. ABSTRACT (Maximum 200 words) <p>The synthesis of the copolymer of 4-4'-diaminodiphenylamine sulfate with terephthaloyl chloride, (a copolymer of polyamide and polyaniline), is reported. After doping with SO₃ the conductivity of this copolymer approaches that of salts of polyaniline derivatives.</p> <div style="text-align: center; margin-top: 20px;"> </div> <div style="text-align: right; margin-top: 20px;"> </div> <div style="margin-top: 20px;"> <p>92 8 28 094</p> <p style="text-align: right;">788</p> </div>					
14. SUBJECT TERMS 4-4'-diaminodiphenylamine sulfate, terephthaloyl chloride, polyaniline, polyamide, resistance, electron-withdrawing properties, ketone functional group, synthesis.				15. NUMBER OF PAGES 12	
				16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UL		

OFFICE OF NAVAL RESEARCH

GRANT NO.: N00014-90-J-1559

R & T CODE NO.: A400004DF3

TECHNICAL REPORT NO.: 1992-12

"SYNTHESIS AND CONDUCTIVITY OF COPOLYMER OF
4-4'-DIAMINODIPHENYLAMINE AND TEREPHTHALOYL CHLORIDE"

by

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Accepted for Publication in
Polymer (1991)

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June 5, 1992

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August 24, 1991

**SYNTHESIS AND CONDUCTIVITY OF
COPOLYMER OF
4-4'-DIAMINODIPHENYLAMINE AND
TEREPHTHALOYL CHLORIDE**

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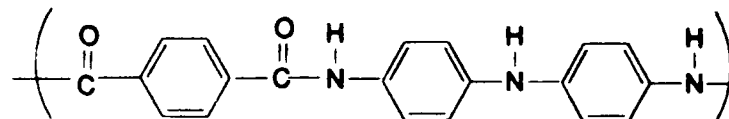
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ABSTRACT

The synthesis of the copolymer of 4-4' diaminodiphenylamine sulfate with terephthaloyl chloride, (a copolymer of polyamide and polyaniline), is reported. After doping with SO_3 the conductivity of this copolymer approaches that of salts of polyaniline derivatives.

The chemical structure and conductivity of polyaniline are of interest.^{1, 2} Attempts to improve its mechanical properties can be made through the formation of copolymers of polyaniline with other polymers, such as polyamide, which are known to possess desirable mechanical properties. In this paper we report the preparation of the copolymer of 4-4' diaminodiphenylamine sulfate with terephthaloyl chloride and its conductivity with SO₃ doping. The mechanical properties are left to further investigation.

The sample was synthesized using the following procedure. Two solutions were prepared, the first being 0.2 grams of 4-4'-diaminodiphenylamine sulfate (Aldrich) in 50 ml. of 0.01 M NaOH. The second solution was composed of 0.25 grams of terephthaloyl chloride (Aldrich) in 20 ml. of chloroform. The chloroform solution was added dropwise to the first, while stirring, until a yellow-green polymer with a structure



was formed. This solution was then stirred for 20 minutes. The polymer was isolated by suction filtration with a succession of wash solutions. These were, in order, 1.0 M HCl, carbon tetrachloride, and a final rinse with methanol to remove any unreacted remnants. The polymer was then dried using a dynamic vacuum. The conductivity of the polymer was determined by the resistance of a thin film of the polymer, prepared by dissolving the polymer in concentrated sulfuric acid, then casting the polymer solution onto a substrate and subsequently submersing it in water thereby forming a thin

(100 μm) film. The resulting film was then washed with water to remove any remaining acid. Two probes were attached to the sample for monitoring the conductivity. The film was placed into an SO_3 atmosphere for doping. The resistance, monitored with a multimeter, was found to decrease as time elapsed, figure 1. This increase in conductivity may be due to a successful doping of amine nitrogen atoms of the polymer backbone. The doped form of the polymer is not stable in air likely due to the strong electron-withdrawing properties of the ketone functional group.

Acknowledgment. This research has been supported in part by the Defense Advanced Research Projects Agency through a contract monitored by the U.S. Office of Naval Research.

References

- ¹See, for examples, Proc. Int. Conf. on Sci. & Tech. of Synth. Met.,
Tübingen, Germany, 2~9 Sept. 1990 *Synth. Met.* **1991** 41-43; and Sante
Fe, NM 25 June ~ 2 July 1987 *Synth. Met* **1989** 27-29.
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317.

Figure Caption

The conductivity of the polymer as a function of doping time in SO₃ gas
atmosphere.

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